

CLAIMS

What is claimed is:

1. A method of making a cured multilayer coating that provides an improved edge corrosion resistance to a substrate, said method comprising the steps of:

5 (A) applying by electrophoretic deposition a first curable coating composition to the substrate thereby establishing a coated substrate, the first curable coating composition comprising;

(i) a first compound comprising one or more active hydrogen-containing groups,

10 (ii) a first curing agent comprising one or more functional groups reactive with the active hydrogen-containing groups of the first compound, and

(iii) an electroconductive additive,

15 (B) subjecting the coated substrate to an amount of energy sufficient to cause the coated substrate to become a conductive coated substrate having an electrical conductivity of at least 130 S/cm due to the electroconductive additive;

20 (C) applying a second curable coating composition to the conductive coated substrate thereby establishing a multicoated substrate, the second curable coating composition comprising;

(i) a second compound comprising one or more active hydrogen-containing groups, and

25 (ii) a second curing agent comprising one or more functional groups reactive with the active hydrogen-containing groups of the second compound, and

(D) subjecting the multicoated substrate to an amount of energy sufficient for cross-linking the first and second curable coating compositions to make the cured multilayer coating that provides the improved edge corrosion resistance to the substrate.

5 2. The method as set forth in claim 1 wherein the step of (C) applying the second curable coating composition is further defined as applying by electrophoretic deposition the second curable coating composition to the conductive coated substrate.

10 3. The method as set forth in claim 1 wherein the step of (C) applying the second curable coating composition is further defined as spray applying the second curable coating composition to the conductive coated substrate.

15 4. The method as set forth in claim 1 wherein the step of (B) subjecting the coated substrate to the amount of energy sufficient to cause the coated substrate to become a conductive coated substrate is further defined as subjecting the coated substrate to an amount of energy sufficient for cross-linking of the first curable coating composition.

 5. The method as set forth in claim 1 wherein the step of (B) is further defined as curing the coated substrate at a temperature of 375°F or less for 45 minutes or less, and the step of (D) is further defined as curing the multicoated substrate at a temperature of 375°F or less for 45 minutes or less.

20 6. The method as set forth in claim 1 wherein the first compound comprises an amine-modified epoxy resin.

 7. The method as set forth in claim 1 wherein the first curing agent is selected from the group consisting of aminoplast resins, phenolic resins, and combinations thereof.

8. The method as set forth in claim 1 wherein the first curing agent comprises polyisocyanate resins.

9. The method as set forth in claim 1 wherein the electroconductive additive comprises electroconductive carbon black pigment present in an amount from
5 1.5 to 5.1 parts by weight based on 100 parts by weight of total solids of the first curable coating composition.

10. The method as set forth in claim 9 wherein the electroconductive carbon black pigment has an iodine absorption of from 870 to 930 mg/g, a specific surface area (BET/N₂) of from 850 to 1,150 m²/g, a pore volume (DBP) of from 330 to
10 470 ml/100 g, and an average particle size of from 25 to 35 nm.

11. The method as set forth in claim 1 wherein the first curable coating composition is free of flow control additives.

12. The method as set forth in claim 1 wherein the second curable coating composition is free of flow control additives.

13. The method as set forth in claim 11 wherein the second curable coating composition is free of flow control additives.

14. The method as set forth in claim 1 wherein the edge corrosion resistance is improved by at least 100%, as measured according to an Edge Corrosion Test.

15. The method as set forth in claim 1 wherein a surface roughness, Ra, of the cured multilayer coating is maintained at or below 13 μin.

16. The method as set forth in claim 1 wherein the edge corrosion resistance is improved by at least 100%, as measured according to an Edge Corrosion Test, while a surface roughness, Ra, of the cured multilayer coating is maintained at or
25 below 13 μin.

17. The method as set forth in claim 1 further comprising the step of providing an automotive body panel as the substrate to have the improved edge corrosion resistance.

18. The method as set forth in claim 1 wherein the first curable coating composition is an anodic electrocoat coating composition.

19. The method as set forth in claim 1 wherein the first curable coating composition is a cathodic electrocoat coating composition.

20. The method as set forth in claim 2 wherein the second curable coating composition is an anodic electrocoat coating composition.

21. The method as set forth in claim 2 wherein the second curable coating composition is a cathodic electrocoat coating composition.

22. The method as set forth in claim 1 wherein the second curable coating composition is a solventborne coating composition.

23. The method as set forth in claim 1 wherein the second curable coating composition is a waterborne coating composition.

24. The method as set forth in claim 1 wherein the second curable coating composition is a color-keyed primer surfacer coating composition.

25. A cured multilayer coating for providing improved edge corrosion resistance to a substrate, said cured multilayer coating comprising:

(A) a first coating layer resulting from curing a first curable coating composition comprising;

5 (i) a first compound comprising one or more active hydrogen-containing groups,

(ii) a first curing agent comprising one or more functional groups reactive with said active hydrogen-containing groups of said first compound, and

10 (iii) an electroconductive additive suitable for providing said first coating layer with an electrical conductivity on the substrate of at least 130 S/cm,

(B) a second coating layer resulting from curing a second curable coating composition comprising;

15 (i) a second compound comprising one or more active hydrogen-containing groups, and

(ii) a second curing agent comprising one or more functional groups reactive with said active hydrogen-containing groups of said second compound,

20 wherein said cured multilayer coating provides an edge corrosion resistance improved by at least 100%, as measured according to an Edge Corrosion Test, while a surface roughness, Ra, of said cured multilayer coating is maintained at or below 13 $\mu\text{in.}$